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ABSTRACT

This report details how Ethiopia's Ministry of Education has met the challenges of the information age by investing in computer technology to plan and manage an education management information system (EMIS) in hopes of closing the widening technological gap between itself and other industrialized nations. The major objective for the EMIS is to make available both the data and the policy-relevant information (through the application of analytical tools and skills to the planners and decision-makers) to enhance competence of the education sector in planning, research and management. Prior to the computerization project, information was mostly outdated, limited and un-interpretable; it has been seen that the implementation of the EMIS system has eradicated these problems. However, other information needs have yet to be met. Policymakers' information needs surpass the mere tabulation of raw data; they demand data analyses that will form the basis for policy simulations, forecasts, and productivity measures. These demands may be met through an integrated systems approach to information retrieval and analysis in the education information system, including report writing, layout design, and publications. Other Ministry of Education recommendations include the establishment of computer science and technical training programs at educational institutions and Unesco consultational meetings on both the sub-regional and regional levels. (MAB)

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The Role of Information System for Education Planning and Management

submitted

by

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1. The Potential of the Information Age

In pursuing the goal of universal primary education and literacy, many developing countries in the past decade have experienced a rapid increase in the volume and variations within the domain of the education system. Planning and management of this rapidly expanding system have become highly over-loaded and complex. Keeping up with these developments requires, not simply increasing the number of employees, but, equally or more importantly, also improvement in the methodology and the tools of planning and management. Among these are the innovative applications of the information sciences and the computer technology.

Due to the greatly improved world communication and, in no small measure, technical assistance programmes, there has been an increasing awareness of the great potential benefits of the modern information sciences in the developing countries. However, there have been great obstacles to their implementation. To apply these methods on a scale required for the expanded education system of a whole country, the necessary resources were not available to the education planners and managers in the developing countries.

With the advent of the micro-computers and the subsequent decline in the price and increase in the power of computers, the computer revolution has spread all around the world. For the first time, it has become possible to input voluminous data on many aspects of the education system into the computer and relate them in many new ways to retrieve such information which was previously unattainable. The computer-based information system has opened up the possibility of applying complex mathematical models to the analysis of voluminous data and deriving forecasts, projections and policy simulations.

We are only at the beginning stage of a historical development that will have profound and accelerating impact on not only the lives of the education planners and managers, but potentially also the lives of millions of peoples who aspire for education and better quality of life for themselves and their children.

* With the acknowledgment of the valuable contribution to this paper by Dr. Ko-Chih R. Tung, Senior Advisor on Education Management Information Systems, Swedish International Development Authority and the Ministry of Education, Addis Ababa.

The impact of these developments upon our societies will be more far-reaching than the earlier types of societal transformations. As stated in the 1988 main working document of the Unesco's Intergovernmental Committee for the Intergovernmental Informatics Programme, "Information technologies play a catalytic role in the metamorphosis of civilization. All human activities are now affected by the possibilities of converting, processing, storing and communicating informatics. Labour productivity, the organization of power, consumer patterns, education, ways of life and culture have been transformed. We are witnessing not only the birth of an 'information and communication society', but also the advent of a 'learning civilization' ushering in new practical skills, new communication skills and new life skills."

How are we in the developing world going to meet this challenge? The same Unesco document reports that already "This sudden process of change, triggered by informatics ... has widened the gap between the most developed and the most disadvantaged countries." We cannot passively let this trend continue. We cannot postpone the day we must take action, for everyday it becomes even more difficult to meet the challenge. Unlike the earlier societal transformations which took hundreds and thousands of years, this change is taking place at a very fast and ever accelerating pace.

While it is encouraging that international bodies have taken up these issues and are initiating cooperative programmes, it is also incumbent upon the countries of the developing world to take their own initiatives in this area, for this challenge is the transformation of the mind and the society. Throughout history, education has been called upon to transform the human being and the society. This call is certainly more challenging now than ever before, as the path to this 'learning civilization' is built on the very foundation of knowledge and skills as well as the technology of the information sciences.

For the developing countries, it means that, alongside the literacy campaign in basic education to liberate individuals from misery and poverty of ignorance, there must be also a literacy campaign in the information sciences in our schools and higher institutions of learning to liberate us from inefficiency and incapacity due to higher-order ignorance and to construct the new society. Our institutions of learning must produce the manpower capable of applying informatics to the solution of our social and economic problems through a systematic and efficient approach to planning, implementation, operations, and management of institution-building, organization, production, distribution, and communication in all areas of our national development efforts.

The Ministry of Education in Ethiopia has recently embarked on a programme to establish an information system for education planning and management within the Ministry. This programme, already at this initial stage, has produced some achievements. Along the way, there have been problems and seemingly insurmountable obstacles and there may be more to come. These have resulted in many useful lessons and guidelines.

This paper discusses the role of information system for educational planning and management in general terms as well as in terms of the Ethiopian development strategy and experiences.

2. Objectives of Information System for Education Planning and Management

Neither rational nor responsive decision-making can be better than the information available to the decision- makers. While more information does not guarantee better decisions, crude information often begets crude decisions. In this context, the establishment of an education management information system (EMIS) is essential.

In the current education crisis, efficient information system is more important than ever for planning and management. The major objectives of the information system are to make available both the data and the policy-relevant information through the application of analytical tools and skills to the planners and decision-makers, to enhance the capacity and competence of the education sector in planning, research and management of the national efforts toward the goal of providing education to a greater number of people who are in need of liberation from poverty born of ignorance and lack of skills. This is a strategic investment with long-range and broad implications for the future.

Therefore, the establishment and improvement of information system has been of a high priority of the Ministry of Education of Ethiopia, because of their strategic role in the formulation of policies relevant to the real conditions within the country and to make optimal allocation and management of scarce resources for attaining the educational goals of Ethiopia.

3. Education Policy Implementation Cycle and Information Needs

Typically the policy cycle resides in a hierarchy of decision-making levels (see diagram 1) and each level has different information requirements.

Diagram 1: Hierarchy of Decision-Making

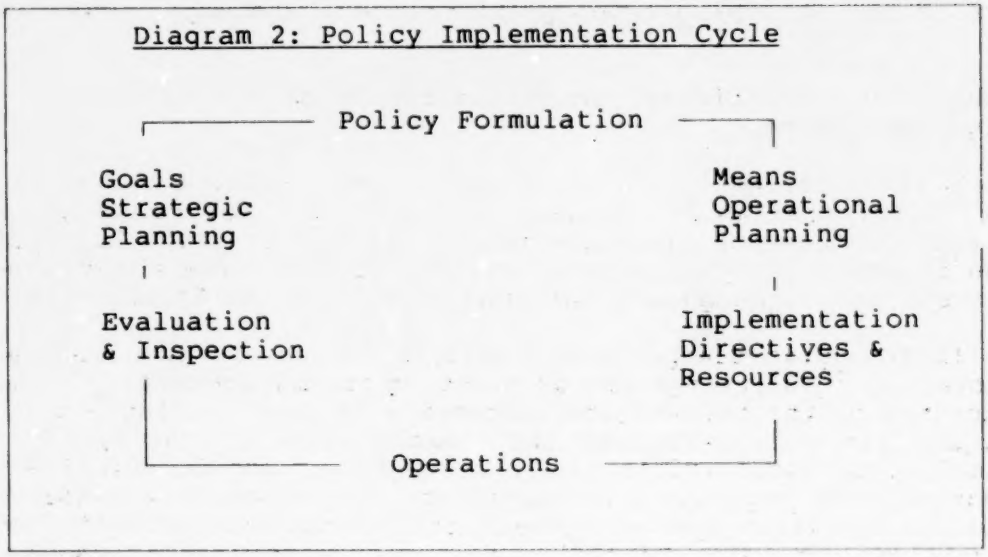
Strategic planning

Management control

Operational control

Operations

To illustrate the role of the information system in education planning and management, let us briefly examine the phases of the cycle of policy formulation and implementation in general terms (diagram 2):



In this cycle, relevant and timely information and informed and skillful analysis are essential for the following phases of policy cycle:

1. strategic planning for goal definition and target-setting
2. policy formulation for harmonious directives among many alternatives
3. implementation planning for quantitative target setting, matching goals and means
4. operations for efficient input-to-output process, mobilization and allocation of scarce resources,
5. monitoring the progress of implementation, and
6. evaluation for performance measurement and problem identification

In the Ethiopian education context, the major consumers of the information output are the policy-makers consisting of the following:

the Minister,
the Vice Ministers, and
the Policy Committee;

operations departments such as the SCMS for school construction, EMPDA for educational materials production, Curriculum Dept. for curriculum development and textbook design, etc.; and the funding agencies such as SIDA, World Bank, etc.

4. Information Processing and Analysis

For the type of decision-making conducted in education planning, monitoring and implementation, ordinary notion of information is inadequate. For these purposes, information required by these consumers are forecasts, projections, policy simulations, measurement of efficiency, productivity, distribution,

correlation, independent effects, etc. Information processing must go beyond mere description toward analyses of the relationships between:

demand factors such as demographic structure, its geographical distribution and differential growth rates

with

supply factors such as financial resources, teacher training, school construction, textbook production, etc.

and

conditional factors such as type of economy, community development level, socio-cultural variations, etc.

How these factors are related are the object of analysis as well as the basis of various planning, forecasting, projection and simulation models. Hence, in an advanced form of information system, these models are integral part of the information processing algorithms.

To meet this kind of demand, information system has added tasks beyond simple data tabulation. It requires various tools of analysis and staff training in the various methods of analysis and their application to educational policy contexts.

5. Information Systems Application Areas

There are subsystems in the general information system, usually corresponding to the functional division of the host organization. From the perspective of the required analysis, the information generated from the various subsystems must be able to be integrated. Hence, although divided into separate parts corresponding to the organizational divisions, an integrated systems approach is necessary to enable the type of analysis required for policy and planning decision-making.

In the case of the Ethiopian system for educational planning and management, thee following (* scheduled for implementation in the first phase) constitute the various subsystems:

(A) **Administration:**
- *(1) financial control and accounting;
- *(2) personnel administration;
- (3) archive of the documentation unit;

(B) **Planning & Research:**
- *(4) annual educational statistical survey (AESS);
- (5) survey research data archive and analysis;
- *(6) forecasting, modelling and simulation;

(C) **Project Management:**
- *(7) capital project management;
- *(8) procurement, especially tender evaluation;

(D) **Operations** of various departments:
(9) inventory & material-flow control, EMPDA & SCMS;
*(10) exam optical processing;
(11) school maintenance monitoring system, SCMS;

(E) **General:**
*(12) Amharic wordprocessing and database management;
(13) computer-aided publications.

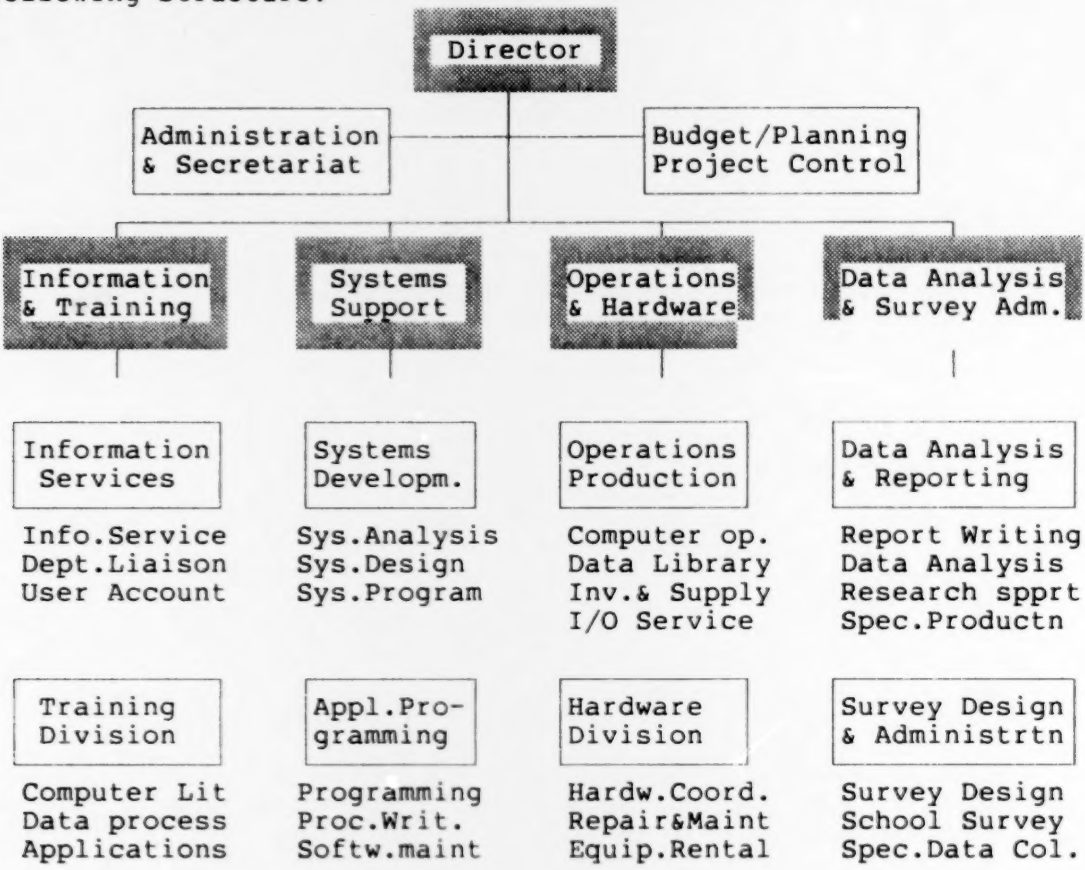
Each of these areas is important for the efficiency of the MoE. Some areas pertain to the central services (egs., planning, personnel, accounting, payroll) and others to departmental operations (egs., exam optical processing, school buildings monitoring). Some are conducted within several geographically separated departments. Accounting, for example, is conducted both at the central level and within every department; research is conducted by research units within certain departments (Planning, Curriculum, Adult Education, Examination, Mass Media, etc.). Computer facilities must take these characteristics into account and must enable the integration of the information from these various subsystems.

6. Computer Facility Configuration

A semi-centralized "**distributed system**", corresponding to the MoE structure and layout, has been proposed in the case of the Ethiopian system. The Education Management Information System (EMIS) Centre will be equipped with a mini-computer, hosting about 30 on-line terminals, to service mainly the central information processing functions, and to provide user training and support services. In the order of priority, selected departments will be equipped with compatible micro-based systems. This configuration will be robust, open to future network link-up, and will meet the various specific needs of the MoE, with the central guidance and support.

7. Organizational Structure and Staff

While each departmental computer site will have trained end-user(s), the EMIS Centre staff members are organized within the following structure:



8. A Nation-Wide Perspective

Where the domain of the responsibility of the education planners and decision-makers encompass a whole country, the information system must correspondingly also be approached from a nation-wide perspective. In this wider perspective, information system is not confined around the computer center at the national headquarter office. It must necessarily encompass the structure of the education system in its entirety, if the educational policy at the national level is to have any impact on the implementation at the school level.

In Ethiopia, for example, two recent measures to construct a more effective organization of the education system have put a greater demand for information than ever before.

One measure is to effectuate a horizontal integration of the education system by merging the sub-sectors of both general

education (formal and non-formal) and higher education (universities, colleges and teacher training institutes) under the re-organized Ministry of Education. This measure facilitates a more integrated approach to educational policies, but requires also a correspondingly integrated information system.

The other measure is the vertical de-centralization of the structure of the education system across the whole country. The sub-national planning and implementation structure is being decentralized from the current 16 large regional groupings into 32 smaller, more manageable regions and from 106 into 356 awraja education offices. While this measure facilitates more locally responsive planning and implementation, it means also that the organization of information system must accordingly be restructured, and that data collection and reporting will have to deal with more forms, offices and staff who will require training and logistical support.

9. Ethiopian Experience and Plans

Education information system project in Ethiopia, because of its success, has created a greater demand for more and pertinent information. Prior to the computerization project, information was mostly outdated (3 years), limited (only gross enrolment) and un-interpretable (raw aggregation tables). As the quality of information and promptness of reporting improved, decision-makers came to rely more upon the information for their decision-making. Of course, this is the intention of the whole project.

During the next phase, the MoE will put an emphasis on the integration and application of these to a more effective planning and management of the resources for meeting the educational needs of Ethiopia. Specifically, it will increasingly employ an integrated approach to information retrieval and analysis, relating student performance data (examination results, repetition, dropouts) to teacher data (teacher qualifications, pupil/teacher ratio), school data (type of school, size, location, etc.) as well as community characteristics data. Already, in connection with the Female Participation Study, the MoE has also began to incorporate community environmental data (urban/rural, economy, language, etc.) for the sampled school catchment areas.

Whereas the database implementation and production of statistical tables are now routine, the remaining problems are in the areas of integrated approach to education information system, analysis, report writing, layout design and publications, both in terms of trained manpower and material costs. The coverage of the non-formal sector has been largely restricted to the Literacy Campaign, but a more extensive coverage is planned for the next phase.

In order to meet these demands, the following activities are planned for the next two years:

1. Improvement of the standard statistical coverage to include both the formal and the non-formal sub-sectors.

2. Establishment of the following data bases.

   a) Performance data in regard to participation, examination results, repetition and dropout of different target groups (e.g female, urban-rural population).

   b) Environmental data in regard to demographic, economic and socio-cultural characteristics of respective education catchment areas.

   c)Educational resource data in regard to teacher manpower, text distribution, school finance, school buildings, etc.

3. Staff training: in-country, inter-mediate level data analysis methods relevant to respective areas of educational policy; and abroad, advanced level.

4. Publication of statistical reports and thematic studies.

5. The preparation, publication and distribution of the planning manual.

6. The upgrading of the manpower at all levels through workshops, seminars and in-service courses in educational planning and statistics.

7. Staff training of the officers of selected regional offices in computer-aided educational planning and statistics.

8. Conclusions

When introduced piecemeal and without any preconceived plan, computerization is inevitably both costly and lacking in coherence. For states and organizations alike, it is necessary to work out a policy and short-, medium- and long-term strategies. With such a systematic approach, the Ministry of Education of Ethiopia had taken first steps toward meeting the challenge of the information age.

Although the introduction of computer technology in the developing world is a recent phenomenon, there is already an extensive experience showing that investment in computer technology can be in the long-run a very economical endeavour, but only if it is applied to information that is of value to the goals of the organization and accompanied by a comprehensive training programme for various categories of personnel affected by the programme. This must include both the present and future decision-makers, planners and managers as well as computer specialists and operators.

The information system at the Ministry of Education, has begun to provide an output which has an impact upon efficiency and capacity for planning and management. Information technology has become an effective tool and, to achieve higher levels of efficiency, even indispensable. However, there is still a long way to

go, because successful achievement depends on, not only the import of the machines, but more importantly in the long-run, the national capability of producing its own computer specialists and various analysts in the important areas of applications in policy-formulation, planning, administration and management.

These steps are only the necessary beginnings and, without a national capacity for producing its own skilled manpower through its own institution of higher learning, even these isolated pilot projects cannot be sustained in the long-run, as they will always remain dependent upon continued external help.

A valuable lesson from our programme is the importance of achieving national capacity and, to attain this objective, there is a great need for cooperation in this area. We cannot isolate our efforts from the others, but we must join our efforts. At this stage of development in our respective countries and Africa as a whole, it is an opportune moment for sharing our experiences in the field of information sciences and computer application, and to formulate a programme of sub- regional, regional international cooperation.

10. Recommendations

At the Unesco Sub-Regional consultation Meeting on Computer Applications in Educational Planning and Management, held in Ethiopia, 21-26 October 1988, we have formulated some recommendations to international organizations. The following is the summary of the recommendations which are relevant to the present context of this paper.

It is recommended that consultation meetings be organized regularly at the sub-regional as well as regional levels. These meetings will help each Member State to learn from the experience of others.

Regional co-operation for the development of computer science and technology should be strengthened through the establishing of appropriate training centers, and operational networks that can provide needed assistance to each Africa Member State.

The United Nations Development Programme, the World Bank and other international development agencies are requested to support the regional programme for the development of micro- informatics applications in education statistics production, planning and management.

In areas of technical cooperation and financing, greater efforts have to be provided by international development agencies and funding bodies in connection with the relevant needs of the less developed Member States. These efforts should be based on sound feasibility studies and implementation plans prepared by national educational services in close collaboration with the technical services of supporting institutions.

African Member States must establish and strengthen technical

cooperation among them, particularly in the field of computer applications to education. This technical cooperation will be of great interest, in terms of cost effectiveness and efficiency for the implementation of regional projects as well as specific national projects.

The development of computer science at the university level is an important factor in the medium and long term for building, maintaining and developing computerized information system not only in education but in other economic and social sectors and sub-sectors. Members should put emphasis on the training of computer staff which will constitute a reliable basis for the development of computer applications within the society.